CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

Other proposals

Executive summary

- The Basking Shark (*Cetorhinus maximus)* is widely distributed in coastal waters and on the continental shelves of temperate zones in the northern and southern hemispheres. The species is planktivorous, bears a small number of live young (ovoviviparous) and is the second largest fish in the world (up to 10m in length and 5-7t in weight), exceeded only by the whale shark *Rhincodon typus*.

- *C. maximus* is considered to be **Vulnerable** in the 1996 IUCN Red List based on past records of declining populations, due to over-exploitation by fisheries, slow recovery rates and the potential for similar declines to occur in future due to targeted and by-catch fisheries.

- The biology of the species makes it especially vulnerable to exploitation: it has a slow growth rate, a long time to sexual maturity (c. 12-20 years), a long gestation period (1-3 years) and a similar interval between pregnancies, low fecundity (the only recorded litter was of just six very large pups), and probable small populations. However, the species is poorly studied and many aspects of its life history remain to be elucidated. Its habit of 'basking' at the surface makes it vulnerable to harpoon fisheries.

- There are a few well-documented fisheries for *C. maximus* (especially from the NE Atlantic) and these suggest stock reductions of 50-90% over short periods (typically a few decades or less). These declines have persisted into the long-term with no apparent recovery several decades after exploitation has ceased. Other data, based on sightings and less well-recorded fisheries, suggest similar declines.

- Traditionally, basking sharks have been hunted for their liver which yields an oil rich in squalene. This market is now largely superseded but demand for the fins of *C. maximus* has increased. Fins are known to enter international trade, particularly from the NE Atlantic to eastern Asia where they command a high value, either fresh or dried, as a food item. This demand currently maintains the viability of targeted fisheries for this species and encourages incidental take in non-target fisheries. A single *C. maximus* can yield over 90kg of fins and reported prices range from $100-300/kg (dried) and $26/kg (fresh). Fins, if unprocessed, are identifiable in trade; an identification sheet is provided to assist with this. There is only limited demand for the flesh and cartilage of this shark, however, a DNA test is in development to identify parts and derivatives in trade.

- This species meets the criteria listed in Conference Resolution 9.24, Annex 2a, Bi, namely that 'it is known, inferred and projected that harvesting of specimens from the wild for international trade has, or may have, a detrimental impact on the species by exceeding, over an extended period, the level that can be continued in perpetuity'. The species also meets criterion in Annex 1, Ci & ii, namely that 'a decline has been either observed as ongoing or as having occurred in the past, and is inferred and projected on the basis of levels or patterns of exploitation'.

· The species is only given protection over a limited part of its range (including Great Britain) and no fisheries are properly managed. This proposal is intended to help ensure that exploitation of this globally threatened species is regulated and monitored, and that international trade is not detrimental to the survival of the species. Due to the inevitable gaps in information for such a poorly studied fish, application of the precautionary principle (as defined in Resolution 9.24) is necessary. Listing on Appendix II will help to implement, in part, the FAO International Plan of Action for the Conservation and Management of Sharks.

A. Proposal

Inclusion of the Basking Shark (*Cetorhinus maximus)* on Appendix II of CITES.

B. Proponent

United Kingdom of Great Britain and Northern Ireland

C. Supporting Statement

1. Taxonomy

1.1 Class:	Chondrichthyes (subclass Elasmobranchii)	
1.2 Order:	Lamniformes	
1.3 Family:	Cetorhinidae	
1.4 Species:	*Cetorhinus maximus* (Gunnerus, 1765)	
1.5 Scientific synonyms:	See Annex 1.	
1.6 Common names:	English:	Basking shark, (traditionally sunfish or sailfish, hoe mother)
	French:	Pélerin
	Spanish:	Peregrino
	Gaelic:	Cearban (Scotland), liabhán mór, liabhán chor gréine (Ireland)
	German:	Riesenhai
	Italian:	Squalo elefante

2. Biological Parameters

2.1 Distribution

Basking sharks occur in the temperate waters of continental and insular shelves. They are very occasionally recorded well offshore in oceanic waters but are most commonly seen very close to the coast. They are not recorded from the tropics, and records from the warmest areas are often of dead, stranded or moribund specimens. They may occur in boreal waters during the summer. Although widely distributed, they are generally infrequently recorded except in a few apparently favoured coastal areas, where they are usually seen in relatively large numbers for only part of the year.

Major north Atlantic range states include Norway, Sweden, the United Kingdom, Ireland, France, Spain, Portugal, Italy, Greece and Turkey in Europe; the USA and Canada (northwest Atlantic and also Northeast Pacific). Other range states include the other Mediterranean countries (possibly excluding the extreme east and southeast), Iceland, Faeroes, Denmark, Russian Federation, and possibly northwest African states.

In the south Atlantic they are recorded from southern Brazil to Uruguay and Argentina and off the west and south coast of Cape Province, South Africa. In the northwest Pacific, they are recorded from Japan to the Republic of Korea, the Democratic People's Republic of Korea and China. In the northeast Pacific they occur from the Gulf of Alaska (USA), through British Columbia (Canada) to Gulf of California, and in the southeast Pacific off Ecuador, Peru and Chile. In Australasia, they are only rarely recorded from Australia (New South Wales, Victoria, Tasmania, south and southwestern Australia) but they are more common in cooler New Zealand waters. (Compagno 1984, Last & Stevens 1994).

Distribution records are characterised by highly seasonal appearances, and the species may be highly migratory, although no long-distance tracking of individuals has been reported. Records in higher latitudes are most common during the spring and summer months, suggesting a seasonal migration occurs. This migration may take place from deep to shallow water or from lower to higher latitudes as sea temperatures rise, or both. In the North Atlantic, basking sharks appear in the southern part of their range in spring, more northern areas in summer, then apparently almost disappear in autumn and winter. The species is thought to over-winter in deep water offshore, but the location of such wintering grounds is generally unknown. They move into shallow shelf waters as the season progresses, particularly after the thermocline has developed and zooplankton densities are at their height.

There is a pronounced spatial and seasonal population segregation, with groups of animals of similar sizes and the same sex often sighted together. Most basking sharks caught in surface fisheries in Scottish waters were recently mated females (F:M ratio of 18:1, Watkins 1958), and 65-70% of sharks taken in Japan were also female. Conversely, catches in sub-surface gill nets off

Newfoundland included twice as many male as female sharks (Lien & Fawcett 1986). Despite the large numbers of mature females taken in fisheries, there is only one known record of a pregnant female (with a litter of six). Newborns and juveniles are also only rarely seen, indicating that their populations occur elsewhere, out of the range of surface fisheries. Tagging programmes using satellite transmitters and other electronic tags are proposed in a number of locations. If successful, these should help to elucidate the migratory routes of these sharks.

2.2 Habitat availability

Habitat availability is not considered to be a constraint for this species. Surface waters preferred for feeding and possibly mating activity appear to be ocean fronts, or close inshore off headlands and islands and in bays where 'tide lines' are formed in areas of strong tidal flow and zooplankton aggregate (Earll 1990, Sims *et al.* 1997, Sims and Quayle 1998). Bonfil (1994) uses observer data to extrapolate to a figure of some 50 basking sharks taken annually in the whole of the Pacific oceanic drift net fisheries, suggesting that only small numbers are found away from the coast

2.3 Population status

The global status of the basking shark is assessed as **Vulnerable** (A1a,d, A2d) in the 1996 *IUCN Red List of Threatened Animals*.

The IUCN assessment is based on past records of rapidly declining local populations of basking sharks as a result of short-term fisheries exploitation and very slow population recovery rates recorded (see fisheries accounts in the following pages). It also takes into account the likely potential for similar population declines to occur in the future from directed fisheries, driven at least in part by the demand for fins in international trade, and from continued global by-catch. Compagno (1984) considers the basking shark "to be extremely vulnerable to overfishing, perhaps more so than most sharks ... ascribed to its slow growth rate, lengthy maturation time, long gestation period, probably low fecundity and probable small size of existing populations (belied by the immense size of individuals in their small schools)." The best estimates of age at maturity for basking sharks are 12-16 years for males, up to 20 years for females, with a litter size of six, and gestation period from 12 to 36 months. Longevity is likely to be 50 years. The interval between litters may be two to four years. (Pauly 1978 and in press, Compagno 1984, Fowler in press.)

No firm estimates are available for the total global population or regional populations of this species. Owen (1984) suggested that as many as 4-6,000 sharks might be present in the Gulf of Maine and off the New England coast (USA) during the summer months but these may represent only 1/7 of the total. He compared this with an estimated population of 2,000 sharks in the Monterey Bay area of the US west coast (Squire 1967). As pointed out by Compagno (1984), it should be noted that basking shark populations are probably very small compared with most other sharks. Most recorded fisheries have taken only hundreds or about one thousand individuals annually for a few years before collapsing. Where observations of basking sharks have been recorded, the total annual number of records is usually in the tens, hundreds, or at most low thousands, including repeat sightings. The total number removed from the whole of the Northeast Atlantic during the past 50 years is probably between 80,000 and 100,000 animals (Annex 2a).

Siccardi (1960, 1971) suggested that there are four species of *Cetorhinus*, two in the North Atlantic and Mediterranean (*C. maximus* and *C. rostratus*), one from southern Australia (*C. maccoyi*), and one from the South Atlantic (*C. normani*). Compagno (1984) and Springer and Gilbert (1976) consider there is insufficient evidence to separate these species. No research has addressed the question of whether genetically distinct sub-populations exist in different oceans or hemispheres. Some tissue sampling is now taking place and the DNA studies supported by the United Kingdom and which are also planned in future may eventually help to clarify the status of various populations.

2.4 Population trends

A few well documented declines in catches by directed fisheries for the basking shark suggest that stock reductions of at least 50% to over 80% have occurred in some areas over a very short period (usually ten years or less, Fowler in press; Annex 1). These declines have resulted in long-term (lasting several decades) reductions in local populations, with apparently little or no migration into the area from other sources. Examples from NE Atlantic are given below (Figures 2-4). However, most other fisheries described in literature (also summarised below) lack accurate recorded data on

landings, market conditions and catch per unit effort. It is therefore not always possible to determine whether a short-term fishery ends for market reasons, or because the local population has declined to a point where difficulty in finding the target animals damages the viability of the fishery. Calculations of natural and fisheries mortality derived from north-west European landings (Pauly, 1978 and in press), however, strongly suggest this species is unable to withstand targeted exploitation for long, and confirm that stock depletion is likely to be a major factor affecting fisheries yields. Pauly (1978 and in press) re-analysed previously published length-frequency data for north-west European basking sharks. Fishing mortality (F) was considered to be 0.094/year in adults, with the ratio of F/Z = 0.6 (where Z = total mortality). Pauly (in press) states that this is 'an exploitation rate that no fish - especially not a long-lived, low-fecundity fish such as the basking shark - can withstand for long (Beddington and Cooke 1983)'.

An additional explanation for the rapid collapse of localised fisheries for a widely distributed and apparently seasonally migratory species, is that basking sharks are site-faithful and tend to return to the same coastal summer 'basking' and feeding locations. Despite their wide-ranging nature, they are effectively part of local stocks that are particularly vulnerable to depletion by fisheries activity (Fowler 1996 and in press).

There is only very limited information available on wider population trends; data indicating changes in catch per unit effort or annual variation in numbers of sightings are only obtainable on a local, or at most regional, scale. Standardised sightings per hour data from the Isle of Man, where the species has been protected since 1990, suggest a decline in shark numbers from the end of the 1980s, with particularly poor sightings in the mid 1990s (Table 1 and Figure 1). Sightings data corrected for effort from a coastal cetacean-watching site in Cornwall for the period 1995-1998 show no significant trend (Speedie in lit.). Other sightings schemes (Scottish Wildlife Trust and Marine Conservation Society) do not correlate sightings with observation effort and so do not enable trends to be assessed reliably. MCS data (Table 2 and Figure 1) still appear to show a decline in reported sightings between the two periods when the public sightings scheme was actively promoted in 1988-91 and 1995-96.

Table 1. Number of basking sharks sighted per hour effort around the Isle of Man (Watterson in lit.)

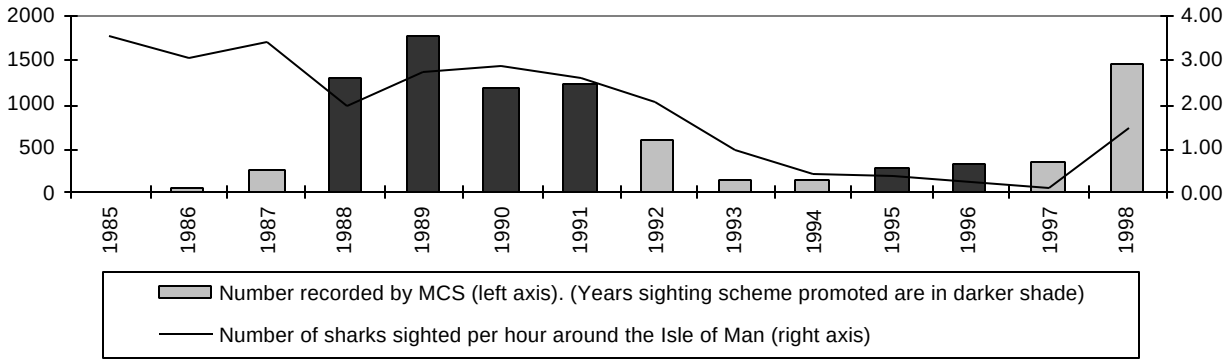
Year	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Sharks/ hour	3.51	3.07	3.36	2.01	2.70	2.85	2.56	2.05	0.92	0.44	0.34	0.22	0.07	1.43

Table 2. Sightings reported to the Marine Conservation Society, 1986 to 1998 (* years during which the sightings scheme was promoted.)

Year	1986	1987	1988*	1989*	1990*	1991*	1992	1993	1994	1995*	1996*	1997	1998
No of reports	66	102	396	509	360	298	130	77	64	130	165	164	175
No. of sharks	40	240	1,283	1,773	1,168	1,226	585	162	161	300	312	331	1,457

Some evidence exists for unpredictable cycles in the numbers of basking sharks entering coastal waters. Certain years (including 1998) have seen very large influxes of sharks to some UK areas, while in others the numbers recorded are low (Kunzlik 1988, Speedie 1998, Fairfax 1998). Landings throughout the Northeast Atlantic have also fluctuated strongly. This annual variation in sightings and catch records may, however, be strongly influenced by weather conditions and water temperature. Some of the fluctuations in north-east Atlantic catches (Figure 4 and Annex 3) may be the result of cyclical fluctuations in zooplankton abundance linked to broad-scale oceanic changes controlled by factors such as summer stratification, the North Atlantic Oscillation or climate (Reid & Planque, in press). Associated changing patterns of basking shark activity may make populations more, or less, vulnerable to fisheries in some years than in others. The life history of the basking shark, with late maturity and low birth rate probably means, however, that any short-term fluctuations in sightings or catches are not reflections of natural fluctuations in total abundance, but of variations in distribution and / or vulnerability to surface harpoon fisheries.

Figure 1. Number of sharks seen/hour around the Isle of Man, and reported to the UK Marine Conservation Society, 1985-1998.



Details of the two major fisheries for basking sharks, from Norway and Ireland, are summarised here. Similar trends have been noted from fisheries in the Canadian Pacific, Scotland, Japan, China and California, USA. These, and incidental, fisheries are detailed in Annex 5 (in English only).

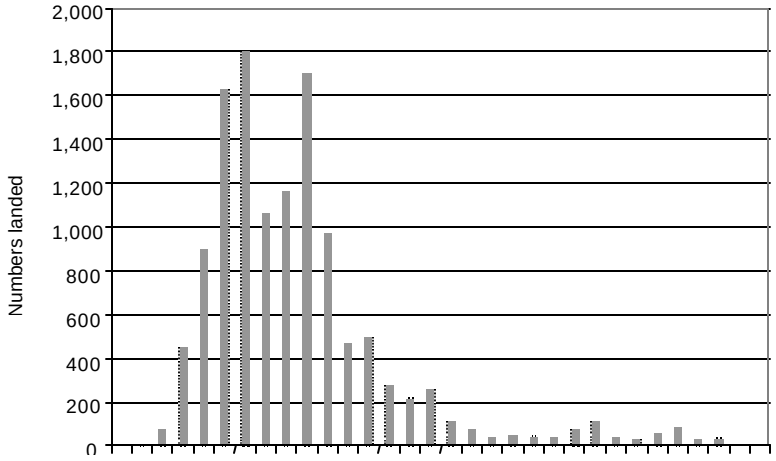
Irish fisheries

The collapse of two historical fisheries off the Irish west coast are well documented: the 18th to 19th Century Sunfish Bank fishery, and the mid-20th Century Achill Island fishery (McNally 1976, Parker & Stott 1965). Large numbers of basking sharks were taken in these areas at the end of the 18th and first quarter of the 19th Century. Records from this period suggest that this fishery was active for several decades between 1770 and 1830. The season only lasted for a few weeks in April and May, but at least 1,000 fish seem likely to have been taken each year at the height of the fishery. In the early 1830s, sharks became very scarce. Despite continued high prices for 'sunfish' (basking shark) oil, the fishery collapsed in the second half of the 19th Century. This scarcity of sharks lasted for several decades. There is evidence that the collapse of the fishery was not due to market factors.

Basking sharks were next recorded in abundance around Achill Island in 1941 (McNally 1976). This was some 50 years after the previous fishery in the area had ceased, and more than 100 years since large numbers of shark had been taken off this coast. A new fishery started in 1947. Between 1,000 and 1,800 sharks were taken each year from 1951 to 1955 (an average of 1,475/year), but a significant decline in catch records occurred from 1956 onwards. Average annual catches were 489 in 1956-1960, 107 in 1961-65, and then about 50-60 *per annum* for the remaining years of the fishery (Figure 2).

There is no evidence that this steady decline in catches was the result of a significant decline in fishing effort, which is considered to have been fairly constant at this shore-based fishing station. Fishing effort actually increased in the early 1970s as a result of increasing oil prices and re-investment, and catches

Figure 2. Landings in the Achill Island basking shark fishery.



rose elsewhere (see below). Regardless, the fishery was unable to increase landings and closed in 1975 (Kunzlik 1988). A total of 12,360 fish had been taken in 29 years at this one site, with 10,676 of these caught from 1949-58 (see Figure 2 & Annex 4).

The collapse of the Achill Island fishery was likely to have been accelerated by the activity of Norwegian basking shark fishermen in west Irish waters (S. Myklevoll pers. comm., quoted in Kunzlik 1988). However, total Norwegian landings for the whole northeast Atlantic (including Norwegian and Scottish coastal waters) were still relatively low during the initial period of decline at Achill Island (Figure 3, Annex 3b). It seems likely that, as in later years, the majority of their catches were being taken off the Norwegian coast at this time.

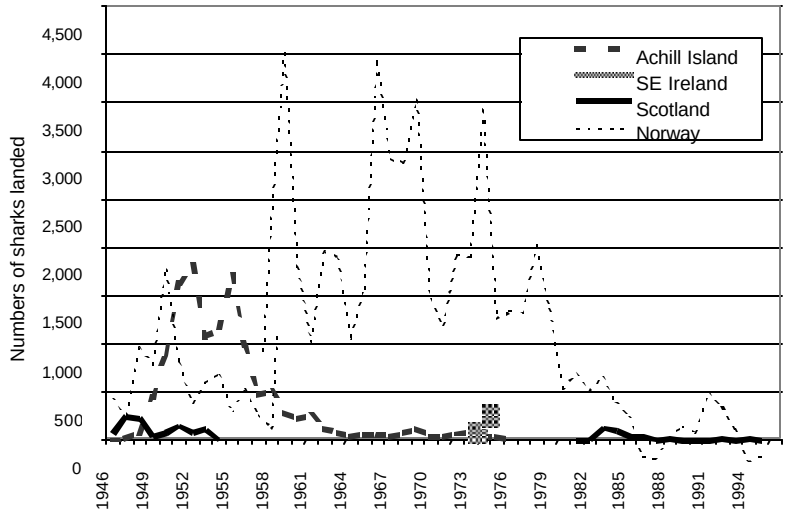
Fowler (1996 and in press) suggests that the percentage decline in the regional population of basking sharks which occurred off the west coast of Ireland during these fisheries was certainly greater than 50%. Indeed, the most recent Achill Island fishery appears to have caused a local population decline of over 80% in less than ten years. Another reason suggested for the decline in the Achill Island fishery is that there was a decline in zooplankton abundance over the same period, which may have affected the number of sharks available to harpoons at the surface (Anon., in press; Reid & Planque, in press). If so, this decline has lasted for forty years.

Northeast Atlantic Norwegian fishery

A very wide-ranging Norwegian fleet, whose geographical and temporal distribution changes markedly from year to year (Stott 1982), has undertaken the major basking shark fishery in the Northeast Atlantic. Landings have been made from local fisheries from the Barents Sea to the Kattegat, across the North Sea to the south and west of Ireland, west coast of Scotland, Iceland and Faeroe (Pawson and Vince 1998), and have fluctuated widely (see Figure 3 and Annex 4).

Catches were at their highest (>1,000 and up to >4,000 in some years) between 1959 and 1980, when over 30 vessels were active for all or part of the season (ICES 1995, Figure 3). Shark oil prices were particularly high from the mid-1970s to the early 1980s, and fishing effort is therefore thought to have remained fairly constant over this period.

Figure 3. Targeted Northeast Atlantic basking shark catches, 1946-1996.

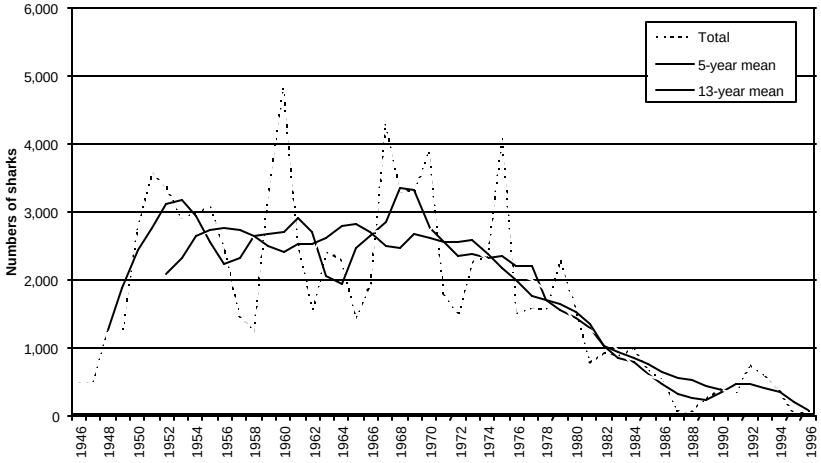


The subsequent decline in this fishery has been attributed (ICES 1995) to the ageing inshore whaling fleet that targeted basking sharks and a decline in value of basking shark liver oil in the late 1980s. This trend would, however, appear to have been offset by the greatly increased value of the fins in international trade in the 1990s. Regardless, at the present time only a few vessels now continue to fish for this species.

Since the precise locations from which the Norwegian fleet fished for basking sharks are uncertain for the first 27 years of the fishery, it is difficult to detect and evaluate trends in catches, effort, and hence population. Figure 4 presents all landings data combined from the Northeast Atlantic since fisheries restarted in the 1940s, with running means added to smooth the fluctuations that may (as discussed above) be the result of climatic or oceanographic factors. This clearly shows a persistent decline in average landings from the early 1970s to the early 1990s. This period of decline includes a period of peak demand and high value for basking shark oil from the mid 1970s to mid 1980s, which encouraged the establishment of new fisheries in southern Ireland and the Firth of Clyde, Scotland. According to ICES (1995), the Norwegian fleet only declined significantly after 1980, and effort has largely been concentrated off the Norwegian coast since 1984.

Although no effort data are available, it may be concluded that the declining catches from 1970 to 1980 represent falling yields from declining stocks (possibly despite increased fishing effort), rather

Figure 4. Total and mean Northeast Atlantic basking shark landings.



than declining fishing effort. This pattern of steeply declining catches is certainly a familiar pattern in other fisheries for large sharks, where much better records, including catch per unit effort data, are available.

Landings increased slightly in the early 1990s (Figures 3 and 4), when the fishery was being sustained by the high value of the fins (ICES 1995, quoting Dr S Myklevoll). The main market for Norwegian fins appears to be Japan, and exports to this market were also increasing steadily in the early 1990s (Directorate for Nature Management, 1995, quoted in Castro *et al*. in preparation). Norwegian catches have since declined to a new low, despite the continued high value of these products and demand in international markets.

2.5 Geographic trends

The species is widely distributed in temperate waters, but large numbers tend to be concentrated in only a few favoured coastal areas where feeding and possibly breeding activity takes place at or near the surface. As noted above, basking sharks are most vulnerable to targeted fisheries where they occur in such surface aggregations. In addition, cyclical variations in patterns of sightings or catches of this species have been reported. These may be linked to alterations in oceanic currents, water temperature and zooplankton aggregations. Long and short-term cycles in plankton abundance have been reported in the Northeast Atlantic and North Sea, with different patterns of abundance being recorded in different areas (Reid *et al*. 1998 a and b).

2.6 Role of the species in its ecosystem

The role of the basking shark in its ecosystem is unknown, but as a large (up to 10m long) plankton feeder this will presumably be similar to that of the smaller baleen whales.

2.7 Threats

The main threat to basking shark populations is from fishing operations – both targeted on basking sharks and incidental or by-catch in other fisheries. However, because these fish congregate in bays

and shallow water, they are also at risk from collisions with vessels and may be harassed by shark watchers. Collisions appear to be a fairly frequent occurrence – large areas of scarring are often observed on the head and dorsal surfaces.

2.7.1 Directed fisheries

Targeted basking shark fisheries use nets to deliberately entangle the fish or harpoon guns to take basking sharks swimming or feeding on the surface. Targeted fisheries have been recorded from Norway, Ireland, Scotland, Iceland, California, China, Japan, Peru, Ecuador (Compagno 1984) and Northern Spain (Evaristo Alfaya pers. comm.). Some of these are described in detail above. All the available evidence suggests that basking shark populations are very vulnerable to targeted fisheries. Populations rapidly decline due to over-exploitation (Annex 3) and numbers may be depressed for many decades thereafter.

2.7.2 Incidental fisheries

Take by incidental fisheries is mainly recorded in set nets and trawls, and is most common in coastal waters. It naturally occurs over a much larger area than targeted fisheries. There is evidence from Newfoundland (Lien and Fawcett 1986, section 3.4) that some incidental fisheries may become targeted fisheries as markets for the products develop. Take from incidental catch (Annex 5) may be significant and either contribute to declines from targeted catch or prevent the recovery of over-fished populations.

Basking sharks caught incidentally during fishing operations for other species are sufficiently resilient to be released, apparently unharmed in many cases, possibly even after up to three hours on the deck of a fishing boat (Lien pers. comm. and Watterson in lit.). The survival of sharks returned in this way is not monitored. However, the high value of their fins (and to a lesser extent liver oil, flesh and cartilage), is a strong incentive for fishermen to kill and utilise rather than release this species.

3. Utilization and trade

The lack of detailed fisheries landings records and trade data at species level, and for specific shark products, presents a major obstacle to determining precisely which products and what quantity are utilised nationally by fishing nations, and which enter international trade (Rose 1996). However, some information can be obtained from literature, personal communications and TRAFFIC reports on the International Shark Trade. Even where basking shark products are eventually utilised in their country of origin, this may often follow initial export in 'raw form' for processing and re-import as a marketable product.

3.1 National utilization

Liver oil

The basking shark reaches weights of up to seven metric tonnes (it is the second largest fish in the world, after the whale shark *Rhincodon typus*). The main parts utilised were, until recently, the liver, which comprises about 17-25% of the body weight and yields 60-75% oil (Phillips 1947, McNally 1976) and originally mainly supplied domestic markets. Indeed, some fisheries formerly removed the livers from the fish at sea and discarded the remainder of the fish. A large shark can provide about 0.7 t (metric tonnes[1]) of oil, but the average is considered to be about 0.4 to 0.5 t per fish. This oil has a very high squalene content (up to 55%, Buranudeen & Richards-Rajadurai 1986), characteristic of deep water sharks, and is therefore primarily of industrial rather than medicinal value. The large amount of oil derived from a single shark has made these fisheries viable in the past, but the liver oil market is presently suffering from competition from the gulper shark *Centrophorus granulosus* and kitefin shark *Dalatias licha* fisheries (ICES 1995). The oil is used in Norway to supply the cosmetic and health supplement markets (Fleming and Papageorgiou 1996). It is uncertain how much of the liver oil landed in most countries is utilised nationally today, but all or most oil landed in the UK in recent years appears to have entered international trade, mainly through export to Norway.

Flesh

[1] Weights are given in metric tonnes (t) unless otherwise stated.

The flesh of basking sharks has been used both for fish meal and, dried or fresh, for human consumption. McNally (1976) records that meat was sold at £2.50 to £3 per ton (£2.54-3.05 per metric tonne) in the early 1960s, which made processing uneconomic. Basking shark flesh was sold in Billingsgate market, London in the 1970s, and in fish and chip shops in Scotland in the 1980s and early 1990s. Prices for the meat were £0.30 to £0.80/kg in the early 1990s (Fleming and Papageorgiou 1996). Chen *et al*. (1996 in Phipps 1996) give a landing value at fishery markets for whole basking sharks in Taiwan as US$1.10/kg.

Fins

Fins landed in Europe and other fishing nations outside southeast Asia are mainly thought to be directed into the international trade, and are not utilised nationally to any significant extent. Fins landed in China and Japan may be used by domestic markets, or exported for processing. Basking shark fins may be re-imported to any country in processed form.

Cartilage

Basking shark cartilage is probably only used domestically in small quantities, and may be exported in 'raw' form before being re-imported as a processed product for use in its country of origin. The large size of the basking shark will likely make the processing of its cartilage more cost effective than cartilage of smaller sharks, increasing the demand for this species.

Skin

No information was obtained on present national utilisation of basking shark skin for leather manufacture.

3.2 Legal international trade

Four basking shark products are known to enter the international trade in significant (albeit largely unrecorded) quantities; liver oil, fins, cartilage and meat. However, no customs data are available on quantities of shark fin, cartilage or oil imports and exports by individual species, and most countries which keep any records of trade in sharks separately from other fish, combine all shark products into a single category. It is therefore impossible to determine precisely the volume of basking shark products which enter international trade or from which populations these products originate. The following information was obtained from literature and TRAFFIC surveys.

Liver oil

The value of the oil has declined in recent decades. Fleming and Papageorgiou (1996) give values of £600/t for liver oil landed in Scotland in the early 1980s, but this had fallen to £230/t in the late 1980s. Fairfax (1998) reports liver prices of £250/t (US$375/t) in the early 1990s, and notes that the liver was no longer landed in the last years of the recent Firth of Clyde fishery in Scotland because the high costs of exporting oil to Norway made exports uneconomic. The Norwegian fishery is reportedly still landing basking shark oil and has been importing large quantities of shark oil (from various species) over the past decade. Basking sharks caught incidentally by New Zealand fisheries are processed for their oil and fins, which are thought mainly to be exported. Where data are available for shark oil exports and imports, these do not differentiate between species of origin. Shark oil records may therefore represent products from basking shark, gulper shark, spiny dogfish, kitefin shark and other fisheries.

Norway is the only country that reports information to Food & Agriculture Organisation (FAO) on the shark oil trade. Norwegian imports have greatly exceeded exports in the period 1988 to 1994, but it is not clear whether processed and subsequently re-exported shark oil products will also appear in the Norwegian export statistics, or whether only unprocessed shark oil is recorded.

Fins

The fins have a very high value in oriental markets. McNally (1976) notes that sales of fins had provided the Achill Island fishery with "a secondary, if relatively small source of income since 1960", when they were exported to Spain from Ireland. By 1970 fins were being exported directly to Hong Kong. Prices paid to fishermen for fins were £3,000/t in the 1970s, but had climbed to £20,000 (US$30,000)/t by 1994 (Fairfax 1998). Fleming and Papageorgiou (1996) record that fins were exported from Scotland to Norway for US$6/kg (£4/kg) in 1983. Prices then rose, with a particularly rapid increase in the early 1990s, and fins for export were US$26.25/kg (£17.50/kg) in 1994, an increase of over 300% in nine years. Fairfax (1998) reports that the largest quantity of fins yielded by a single shark (a large female) in the recent Firth of Clyde fishery was 92 kg. The fins from a single fish could therefore be worth well over US $1,500 (£1,000), and up to US$2,400 (£1,600) to the

fisherman. Norwegian fin exports to Japan have been steadily increasing: 0.096 t of fins were exported in 1992, 7.218 t in 1993, and 26.859 t in 1994 (from letter of Directorate for Nature Management, 21 September 1995, quoted in Castro *et al*. in preparation).

Prices for fins dried for processing are, of course, much higher. A Norwegian fin processor reported that the April 1996 price for dried basking shark fins was about US$130/kg (£90/kg) (Fleming and Papageorgiou 1996). Some fins might be used nationally by oriental restaurants in the countries of origin, but it is thought that virtually all fins taken from basking sharks in European waters and other areas outside Southeast Asia are likely to enter the international trade; some may later be re-imported in processed form. Lum (1996) reports that basking shark fins imported from Norway are the most expensive available in Singapore, at Sg.$400 (£200 or >US$300) per kilogram (dried), or Sg.$88 (£44) per bowl in restaurants.

Parry-Jones (1996b in Phipps 1996) quotes retail prices supplied by an experienced Hong Kong trader of US$25/kg, US$256/kg and US$330/kg respectively for frozen, dried and processed sets of basking shark fins (a fin set usually comprises two pectoral, dorsal and lower caudal fins). More recently (1999), prices of frozen fins have been quoted at $14.50/kg. Another trader quoted a price of US$846/kg for a single (dried) fin weighing 7.3 kg (US$6,176 for the whole fin), presumed to be from either a basking shark or whale shark. In June 1998, a single 1 m high shark fin, considered likely to be from a basking shark, was on sale in a restaurant just outside Chengdu, Sichuan, China, for 80,000 yuan (slightly less than US$10,000) (Antony Whitten, pers. comm.). In 1999 a single large fin was on sale in Beijing, China for 138,000 yuan (US$16.600) (S. Fowler, pers. comm.).

Cartilage

It is impossible to determine the volume of cartilage entering international trade. However, Fleming and Papageorgiou (1996) report that cartilage capsules manufactured and on sale in pharmacies, homeopathic shops and health practitioners in Belgium are labelled as '*ex Ceatarinus maximus pulvis*'. If this labelling is accurate, then the cartilage will certainly have been imported to Belgium; there is no basking shark population in the southern North Sea. This product is also exported from Belgium to France, Portugal, Germany and Switzerland.

Meat

Fleming and Papageorgiou (1996) report that the market for basking shark meat exports from Norway to Eastern Europe is increasing; at a 1996 value of about US$1/kg.

3.3 Illegal trade

All known international trade in basking shark products is legal. Illegal trade will only be taking place if products are derived from areas where the species is protected and where it has been taken illegally (e.g. those areas described in section 4.1); there is no evidence of this, but detailed trade records for this species are not kept.

3.4 Actual or potential trade impacts

The high value of basking shark fins in international trade is reportedly the reason why the Norwegian fishery for this species is still viable, now that liver oil prices have fallen (ICES 1995). There is not thought to be any significant domestic market in Norway or other European countries for unprocessed basking shark fin, so it is concluded that international trade in this product is the main impetus for this targeted fishery.

The value of international trade is also likely having a significant impact on mortality from incidental fisheries. As reported by Lien and Fawcett (1986), the presence of a market for basking shark products, including fins for international trade, encourages Newfoundland cod and salmon fishermen to continue to leave their nets in the water when basking sharks are present, risking collision, entanglement and damage to fishing gear. This is because the value of the shark products exceeds the cost of the damage they cause to nets. In the absence of a market for basking shark products, nets will be removed from the water when these fish are known to be in the area. In effect, the international market for basking shark products has turned an incidental fishery into a targeted fishery. The high value of international trade in basking shark fins also encourages the finning of basking sharks caught incidentally in other fisheries, which might otherwise often be released alive.

3.5 Captive breeding for commercial purposes

None possible.

4. Conservation and Management

4.1 Legal status

4.1.1 National

United Kingdom
The intentional killing, capture or disturbance of basking sharks is prohibited in British waters (to 12 miles offshore) and they are protected from sale, offering for sale, or possessing for the purpose of sale under a 1998 listing on the Wildlife and Countryside Act (1981), Schedule 5.

Isle of Man
The basking shark is protected within a radius of twelve miles around the Isle of Man (a UK Crown Dependency). Despite protection here since 1990, numbers of basking sharks recorded around the Island in recent years have been falling (see Table 1 and Figure 1 in section 2.4).

Guernsey, Channel Islands
The basking shark is strictly protected under fisheries legislation around Guernsey (a UK Crown Dependency).

Florida state waters, USA
The basking shark, which is on the southern edge of its range in Florida, is fully protected in State waters (out to the three mile limit on the east coast, and nine miles on the Gulf coast).

Atlantic and Gulf federal waters (3-200 miles), USA
The basking shark is strictly protected under the US Fishery Management Plan. Directed commercial fishing and landing or sale (either by commercial or recreational fishermen) of the species is prohibited. This prohibition recognises the biological vulnerability (limited reproductive potential and slow surface movements) of the species and was enacted in order to prevent targeted fisheries from developing.

New Zealand
The basking shark is one of several fish species (including some teleosts) which have received partial protection through fisheries legislation (the Fisheries Act 1983). Commercial target fishing for the species has been banned since 1991, although they are allowed to be taken as by-catch.

4.1.2 International

Mediterranean
The Barcelona Convention for the Protection of the Mediterranean Sea (1976) Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean was signed in Barcelona on 10 June 1995. The basking shark *Cetorhinus maximus* is listed on Annex II to the Protocol 'Endangered or Threatened Species' and will therefore receive full protection in the Mediterranean once the Convention is ratified and appropriate legislation in place. The basking shark (Mediterranean population only) was also added to Appendix II (strictly protected species) of the Bern Convention on Conservation of European Wildlife and Natural Habitats in December 1997. This listing has an European Union Reservation, pending progress on the management of other protected species already listed on European legislation.

4.2 Species management

4.2.1 Population monitoring

Very little monitoring of this species takes place, and none provides sufficiently good information to enable population trends to be determined with any reliability. Catches of basking sharks are recorded by some fisheries departments, including Norway, New Zealand (incidental catches) and, formerly, Scotland. However, most (if not all) other countries

reporting on their elasmobranch landings do not differentiate between species of shark (only providing figures for total tonnage landed); weights of products rather than numbers of fish are reported; and little or no effort data are available. Even where catches are reported accurately, there are no catch per unit effort data available to enable fisheries yields to be extrapolated to provide overall population trends.

Three public sightings recording schemes for the species are presently underway in the UK and are referred to earlier. All sightings are heavily dependent on weather conditions and observer effort. Variation between years in numbers recorded cannot, therefore, reliably be attributed to changes in population size, and sharks a short distance below the surface will usually not be recorded. There is a need to obtain much more reliable population and distribution data for the species, including information on directed and incidental fisheries landings, population dynamics, reproductive biology, and migrations between wintering and summering grounds and pupping areas.

4.2.2 Management measures

European Quota
The only known fisheries management for this species followed the establishment of 200 miles fishery limits around European Community countries (including the UK and Ireland) in the 1970s. An annual quota for the Norwegian catch of the species in EC waters was first agreed in 1978, as part of a quota exchange for white fish in Norwegian waters. The basking shark quota stood at 800 tonnes liver weight in 1982 and has since steadily been reduced, to 400 mt liver weight (approximately 800-1000 fish) in 1985, then 200 mt, and has been 100 mt (or about 200-300 sharks per year at an average weight of 0.4-0.5 mt oil per shark) since 1994.

FAO International Plan of Action for the Conservation and Management of Sharks
Management and monitoring of the basking shark and other species of sharks will be required in future under the International Plan of Action for the Conservation and Management of Sharks (IPOA-Sharks), agreed a in Rome, October 1998. This document was endorsed by consensus at the FAO Committee on Fisheries meeting in February 1999, and will be submitted for adoption by the FAO Conference in November 1999. The objective of this FAO IPOA is to ensure the conservation and management of sharks and their long-term sustainable use. It notes that the current state of knowledge of sharks and shark fisheries practices causes problems in the conservation and management of sharks due to the lack of available catch, effort, landings and trade data. *Inter alia*, the IPOA requires States that adopt the Plan (it is voluntary) to identify and pay special attention, in particular, to vulnerable or threatened species, and facilitate the identification and reporting of species-specific biological and trade data. CITES presently offers the only established, effective means of monitoring international trade data at species level.

4.3 Control measures

4.3.1 International trade & domestic measures

No international control measures. No domestic control measures known other than those in 4.1.1.

5. Information on Similar Species

The basking shark is the only species of the family Cetorhinidae. It has a very distinctive appearance, and unlikely to be confused with any other species (except possibly for large specimens of the great white shark (*Carcharodon carcharias*) if it is not clearly seen in areas where their range overlaps - e.g. in southern Australia). The fins of the adults are extremely large and, for this reason alone, are very unlikely to be confused with those of any other species when detached from the body. The whale shark also has very large fins, but the skin of the whale shark (*Rhincodon typus*) is spotted and the fins are rounded at the tips, while the basking shark has pointed fin tips. A draft CITES identification manual sheet is attached as Annex 6 to assist in the identification of basking shark fins in trade. Meat, cartilage and oil in trade are much more difficult to distinguish. Accordingly, the UK has funded the development of a DNA test to enable their critical identification and distinction from the products of other sharks. Results to date have identified two loci that amplify with good specificity from basking shark DNA but not from other sharks tested. This

amplified DNA includes sufficient variation to discriminate basking sharks from other Lamniforme shark species, and is short enough to be amplified from very degraded material. A full report on the method and results will be available at the Conference of Parties.

6. Other Comments

6.1 Comments from other Parties

A draft version of this proposal was circulated with notification 1999/43 and comments have been received from a number of Parties. Switzerland questioned whether basking shark products were readily recognisable: we are happy that these concerns have now been addressed in section 5 and Annex 6. Japan opposed the proposal saying that management by coastal states was a better way forward. Expressions of support for the proposal have been received from Australia, Germany, Italy, Malta, New Zealand, Netherlands, Portugal, Sweden, and USA.

7. Additional Remarks

7.1 Assessment of the basking shark under the CITES biological criteria

This proposal for the listing of the basking shark on Appendix II of CITES is based on the following assessment of the species' biological status, using CITES Appendix II listing criterion B(i) (namely 'It is known, inferred or projected that the harvesting of specimens from the wild for international trade has, or may have, a detrimental impact on the species by: exceeding, over an extended period, the level that can be continued in perpetuity).

1. The species has been subjected to unsustainable fisheries in several parts of the world, including the Northeast Atlantic, Northeast Pacific, and Northwest Pacific (see summary in Annex 3). All these fisheries appear to have exceeded sustainable levels and most caused population collapse in 10-20 years.

2. At least some of the products of some of these fisheries have entered international trade.

3. In recent years European basking shark fisheries have largely been supported economically by the high value of shark fin in international trade.

Criterion A is also met by this assessment, using Appendix I criteria C (i) & (ii), namely a decline in the number of individuals in the wild, which has been either: i) observed as ongoing or as having occurred in the past (but with a potential to resume); or ii) inferred or projected on the basis of any one of the following: levels or patterns of exploitation.

8. References

See Annex 2.

Annexes (English only)

Annex 1. Scientific synonyms of *Cetorhinus maximus*.

Annex 2. References

Annex 3. Trends in fisheries yields or sightings for the basking shark.

Annex 4. North East Atlantic basking shark landings data.

4a. Targeted Northeast Atlantic basking shark landings (numbers of sharks caught), 1946-1996.

4b. Norwegian basking shark landings[3], recorded by ICES Fishing Area from 1973.

Annex 5. Detailed review of additional fisheries for basking shark.

Annex 6. Draft identification sheet for basking shark (to be supplied).

Scientific synonyms of *Cetorhinus maximus*

Halsydrus pontoppidani (Neill, 1809);

Tetroras angiova Rafinesque, 1809;

Squalus gunnerianus Blainville, 1810;

Squalus homianus Blainville 1810;

Squalus pelegrinus Blainville, 1810;

Squalus peregrinus Blainville, 1811;

Squalus (Cetorhinus) gunneri Blainville, 1816;

Squalus (Cetorhinus) shavianus Blainville, 1816;

? *Scoliophis atlanticus* Anon., 1817;

Squalus isodus Macri, 1819;

Squalus rostratus Macri, 1819;

Squalus elephas LeSueur, 1822;

Squalus rashleighanus Couch, 1838;

Squalus rhinoceros Mitchell, *in* DeKey, 1842;

Squalus cetaceus Gronow, 1854;

Polyprosopus macer Couch, 1962;

Cetorhinus blainvillei Brito Capello, 1870;

Selachus pennantii Cornish, 1885;

Cetorhinus maccoyi Barrett, 1933;

Cetorhinus maximus forma infanuncula Deinse & Adriani, 1953;

Cetorhinus maximus normani Siccardi, 1960.

References

Anon. in press. *UK Biodiversity Group Tranche 2 Action Plans. Volume V: maritime species and habitats.* English Nature, Peterborough.

Beddington, J.R. and Cooke, J.G. (1983). The potential yield of fish stocks. *FAO FisheriesTechnical.Paper* (242) 47p.

Berrow, S.D. & Heardman, C. (1994). The basking shark *Cetorhinus maximus* (Gunnerus) in Irish waters - patterns of distribution and abundance. *Proceedings of the Royal Irish Academy 94B*, 2. 101-107.

Berrow, S.D. (1994). Incidental capture of elasmobranchs in the bottom set gill-net fishery off the south coast of Ireland. *Journal of Marine. Biological Association UK*, 74. 837-847.

Bonfil, R. (1994). *Overview of world elasmobranch fisheries*. FAO Fisheries Technical Paper 341. FAO, Rome, Italy.

Buranudeen, F. & Richards-Rajadurai, P.N. (1986). Squalene. *Infofish Marketing Digest* n1/86:42-43.

Cailliet, G.M., Holts, D.B., & Bedford, D. (1993). A review of the commercial fisheries for sharks on the west coast of the United States. *In*: J.Pepperell, J.West, & P.Woon (eds). *Shark Conservation*. Zoological Parks Board of NSW. Australia.

Casey, J.G., Mather, F.J., Mason, J.M. & Hoenig, J. (1978). Offshore fisheries of the Middle Atlantic Bight. In: H. Clepper, (ed.). *Marine recreational fisheries 3: Proc. of the Second Annual Marine Recreational Fisheries Symposium*. 107-129. Sport Fishing Institute, Washington DC.

Castro, J.I., Woodley, C.M., and Brudek, R.L. (In preparation). *Status of shark species*. NMFS, National Oceanographic and Atmospheric Administration, USA, for FAO, Rome.

Chen, C.T., Liu, K.M., Joung, S.J. and Phipps, M.J. 1996. TRAFFIC report on shark fisheries and trade in Taiwan. In: Phipps, M.J. TRAFFIC report on shark fisheries and trade in the East Asian Region. TRAFFIC International, Cambridge, UK.

Clemens, W.A. & Wilby, G.V. (1961). *Fishes of the Pacific coast of Canada*. Fisheries Research Board of Canada, Bull. 86, 2nd Edition.

Compagno, L.J.V. (1984). *Sharks of the World. Hexanchiformes to Lamniformes*. FAO Fisheries Synopsis No. 124, Volume 4, Part 1. FAO, Rome.

Darling, J.D. & Keogh, K.E. (1994). Observations of basking sharks *Cetorhinus maximus* in Clayoquot Sound, British Columbia. *Canadian Field Naturalist* 108, 199-210.

Earll, R.C. (1990). The basking shark: its fishery and conservation. *British Wildlife*. 121-129.

Fairfax, D. (1998). *The basking shark in Scotland: natural history, fishery and conservation*. Tuckwell Press, East Linton, Scotland. 206 pp.

Fleming, E.H. and Papageorgiou, P. (1996.) European regional overview of elasmobranch fisheries and trade in selected Atlantic and Mediterranean countries. TRAFFIC Europe.

Fowler, S.L. (1996). Status of the basking shark *Cetorhinus maximus* (Gunnerus). *Shark News* 6:4-5. Newsletter of the IUCN Shark Specialist Group.

Fowler, S.L. (in press). Status of the basking shark *Cetorhinus maximus* (Gunnerus). *In*: Fowler, S.L., Camhi, M., Burgess, G., Fordham, S., and Musick, J. In press. *Sharks, rays and chimaeras: the status of the Chondrichthyan fishes*. IUCN Species Survival Commission Shark Specialist Group. IUCN, Gland, Switzerland, and Cambridge, UK.

Gauld, J.A. (1989). Records of Porbeagles landed in Scotland, with observations on the biology, distribution and exploitation of the species. *Scottish Fisheries Research Report* 45. Aberdeen.

Holden, M.J. (1968). The rational exploitation of the Scottish-Norwegian stocks of spurdogs (*Squalus acanthias* L.). *Fishery Investigations Series II*, 25(8), 28 pp.

Holden, M.J. (1974). Problems in the rational exploitation of elasmobranch populations and some suggested solutions. In: Harden Jones, F.R. (ed.) *Sea Fisheries Research*. pp 117-137. John Wiley and Sons.

Hueter, R.E. (1998). Philopatry, natal homing and localised stock depletion in sharks. *Shark News* 12, 1-2. Newsletter of the IUCN Shark Specialist Group.

ICES (1995). Report of the Study Group on Elasmobranch Fishes. *ICES CM 1995/G:3*. International Council for the Exploration of the Sea. Denmark.

IUCN (1996). *IUCN Red List of Threatened Animals*. IUCN–The World Conservation Union, Gland, Switzerland, and Cambridge, UK.

Kunzlik, P.A. (1988). The basking shark. *Scottish Fisheries Information Pamphlet No. 14*. Department of Agriculture and Fisheries for Scotland. Aberdeen.

Last, P.R. & Stevens, J.D. (1994). *Sharks and rays of Australia*. CSIRO Division of Fisheries, Australia.

Lien, J. and Aldrich, D. (1982). The basking shark (*Cetorhinus maximus*) in Newfoundland. Report to the Department of Fisheries, Government of Newfoundland and Labrador. 186 pp.

Lien, J. and Fawcett, L. (1986). Distribution of basking sharks *Cetorhinus maximus* incidentally caught in inshore fishing gear in Newfoundland. *Canadian Field-Naturalist*, 100, 246-252.

Lum, M. (1996). Every mouthful of shark's fin in high demand. *Singapore Sunday Times, (Straits Times)* May 19 1996, Leisure page.

McNally, K. (1976). *The Sun-Fish Hunt.* Blackstaff Press, Belfast.

Olsen, A.M. (1954). The biology, migration and growth rate of the school shark *Galeorhinus australis* (Macleay) (Carcharhinidae) in south-eastern Australian waters. *Australian Journal of Marine and Freshwater Research* 5:353-410.

Owen, R.E. (1984). Distribution and ecology of the basking shark *Cetorhinus maximus* (Gunnerus 1765). A Thesis submitted in partial fulfillment of the requirements for the Degree of Master of Science in Oceanography. University of Rhode Island.

Parker, H.W. and Stott, F.C. (1965). Age, size and vertebral calcification in the basking shark *Cetorhinus maximus* (Gunnerus). *Zoologische Mededelingen*, 40, 305-319.

Parry-Jones, R. 1996. TRAFFIC report on shark fisheries and trade in the People's Republic of China. In: Phipps, M.J. TRAFFIC report on shark fisheries and trade in the East Asian Region. TRAFFIC International, Cambridge, UK.

Pauly, D. 1978. A critique of some literature data on the growth, reproduction and mortality of the lamnid shark *Cetorhinus maximus* (Gunnerus). International Council for the Exploration of the Sea. Council Meeting 1978/H:17 Pelagic Fish Committee, 10 pp.

Pauly, D. 1980. On the interrelationships between natural mortality, growth parameters, and mean environmental temperature in 175 fish stocks. *Journal du Conseil International pour l'Exploration de la Mer* 39(3): 175-192.

Pauly, D. in press. Growth and mortality of the basking shark *Cetorhinus maximus* and their implications for management of whale sharks *Rhincodon typus*. In: Fowler, S.L. in press. *Proceedings of International Seminar and Workshop on Elasmobranch biodiversity, conservation and management*, Sabah, July 1997.

Pawson, M. and Vince, M. (1998). Fishery management case studies: Management of shark fisheries in the Northeast Atlantic (FAO Area 27). A report prepared for FAO on the shark, dogfish, skate and ray fisheries and their management in the ICES area, February 1998. Centre for Environment, Fisheries and Aquaculture Science, Lowestoft, England.

Phillips, J.B. (1947). Basking shark fishery revived in California. *California Fish and Game*. V.? 11-23.

Phipps, M.J. (1996). TRAFFIC report on shark fisheries and trade in the East Asian Region. TRAFFIC International, Cambridge, UK.

Rae, B.B. (1962). Porbeagle sharks. *Scottish Fisheries Bulletin* 18, 17-19.

Reid, P.C., Planque, B. and Edwards, M. (1998a). Is observed variability in the long-term results of the Continuous Plankton Recorder survey a response to climate change? *Fish. Oceanography* 7:3/4, 282-288.

Reid, P.C., Edwards, M. E., Hunt, H., and Warner, A.E. (1998b). Phytoplankton change in the North Atlantic. *Nature* 391: 546.

Reid, P.C. & Planque, B. In press. Long-term planktonic variations and the climate of the North Atlantic. In: D. Mills (ed.) *Problems facing salmon in the sea*. Fishing News Books, ?UK

Ripley, W.E. (1946). The biology of the soupfin *Galeorhinus zyopterus* and biochemical studies of the liver. *Fishery Bulletin. California Department Fish Game*, 64, 93pp.

Robinson, G.A. and Hunt, H.G. 1986. Continuous plankton records: annual fluctuations of the plankton in the western English Channel, 1958-83. *Journal of the Marine Biological Association of the United Kingdom*, 66, 791-802.

Roedel, P.M. and Ripley, W.M.E. (1950). California sharks and rays. *California Department Fish Game, Fishery Bulletin* 64:7-37.

Rose, D. (1996). *An overview of world trade in sharks and other cartilaginous fishes*. TRAFFIC International.

Russell, F.S. (1936). On the value of certain plankton animals as indicators of water movements in the English Channel and the North Sea. *Journal of the Marine Biological Association of the United Kingdom*, 20, 309-331.

Siccardi, E.M. (1960). *Cetorhinus* in el Atlantico sur. *In*: Actas y trabajos del Primer Congreso Sudamericano de Zoologia, La Plata, 1959. Vol. 4:251-63.

Siccardi, E.M. (1971). *Cetorhinus* in el Atlantico sur (Elasmobranchii: Cetorhinidae). *Rev. Mus. Argent. Cienc. Nat. Bernardino Rivadavia Inst. Nac. Invest. Cienc. Nat.* 6(2):61-101.

Sims, D.W., Fox, A.M., and Merrett, D.A. (1997). Basking shark occurrence off south-west England in relation to zooplankton abundance. *Journal Fishery. Biology*. 51: 436-440.

Sims, D.W. and Quayle, V.A. (1998). Selective foraging behaviour of basking sharks on zooplankton in a small-scale front. *Nature* 393: 460-464.

Southward, A.J. 1980. The western English Channel – an inconstant ecosystem? *Nature*, London, 285, 361-366.

Speedie, C. (1998). Basking shark report – Cornwall 1998. *Shark focus* No. 3, p.6.

Springer, S. and Gilbert, P.W. (1976). The basking shark *Cetorhinus maximus*, from Florida and California, with comments on its biology and systematics. *Copeia*, *1976*, 47-54.

Squire, J.L. (1967). Observations of basking sharks and great white sharks in Monterey Bay 1948-1950. *Copeia* 1:247-250.

Squire, J.L. (1990). Distribution and apparent abundance of the basking shark *Cetorhinus maximus* off the central and southern California coast, 1962-85. *Marine Fisheries Review* 52(2): 8-11.

Tomás, A.R.G. and Gomes, U.L. (1989). Observacoes sobre a presenca de *Cetorhinus maximus* (Gunnerus, 1765) (Elasmobranchii, Cetrohinidae) no sudeste e sul do Brasil. *B. Inst. Pesca*, 16(1): 111-116.

Uchida, S. 1995. Basking shark. In "*Basic data for the Japanese rare wild animals II* (eds. by Japan Fisheries Resource Conservation Association)", p. 159-167. (In Japanese.)

Walker, T. (1996). Localised stock depletion: does it occur for sharks? *Shark News* 6:1-2. Newsletter of the IUCN Shark Specialist Group.

Watkins, A. 1958. *The Sea My Hunting Ground*. London, Heinemann, 250pp.

Yano, K. [Ken-ichi] 1976. *World of sharks*. Shincho-sha, Tokyo, 230 pp. (In Japanese)

Yano, K. [Ken-ichi] 1979. *Sharks*. Hosei University Press, Tokyo, 267 + 10 pp. (In Japanese).

Trends in fisheries yields or sightings for the basking shark.

Geographical area and description of records.	Time scale	Average catches or sightings per year	Overall (decline) or increase in catches	Average (decline) or increase per decade
Achill Island, Ireland. A targeted coastal basking shark fishery	1947-1975	360/year in 1947-1950, 1,475/year in 1951-1955, 489/year in 1956-1960, 107/year in 1961-1965, 64/year in 1966-1970, 50/year in 1971-1975. Rarely seen in 1990s	(>95% decline in 25 years)	1940s: increase as fishery develops (1950s: 65% decline) (1960s: 30% decline) (1970s: 20% decline and closure)
West coast of Scotland	1946-1953	121/year throughout fishery. 142/year in 1946-1949, 100/year in 1950-1953.	(~30% in 7 years, but trend unclear)	(~30%, but trend unclear)
Firth of Clyde, Scotland	1982-1994	58.6/yr in first 5 years, 4.8/yr in last 5 years.	(>90% in 12 years)	(~90%)
Norwegian catches	1946-1996	837/year in 1946-1950 554/year in 1951-1955, 1,541/year in 1956-1960, 1,792/year in 1961-1965, 3,213/year in 1966-1970, 2,236/year in 1971-1975. 1,706/year in 1976-1980 797/year in 1981-1985 343/year in 1986-1990 403/year in 1991-1995	(87% decline from peak landings in late 1960s to levels in the early 1990s)	~200% increase, 1950s ~100% increase, 1960s (1970s: 47% decrease) (1980s: 80% decrease) (1990s: 60% overall)
Northeast Atlantic (all catches combined)	1946-1996	1,254/year in 1946-1950 2,094/year in 1951-1955, 2,030/year in 1956-1960, 1,899/year in 1961-1965, 3,277/year in 1966-1970, 2,385/year in 1971-1975. 1,706/year in 1976-1980 848/year in 1981-1985 355/year in 1986-1990 407/year in 1991-1995	(90% decline from the main period of peak landings in the late 1960s to landings in the late 1980s) This followed 20 years of fluctuating but rising catches.	~40% increase, 1950s ~20% increase, 1960s (1970s: 40% decrease) (1980s: 65% decrease) (1990s: 80% overall)
Canadian Pacific	1956-1990s	50-60/year killed in 1950s <25/year sighted in 1990s	(50% decline)	Data unclear, but a few years of catches resulted in an approximately 50% decline in sightings over 40 years.
California	1946-1950s	300/yr in 1946 200/yr in late 1940s Fishery closed, early 1950s	(30% decline in first few years, then fishery closed)	Data unclear, but a few years of high catches was followed by closure of the fishery.
Japan	1967-1990s	127/yr average, 1967-1974 150 sharks in 1975 20 sharks in 1976 9 sharks in 1977 6 sharks in 1978 Fishery closed, early 1980s 0-2/year sighted in 1990s	(>95% decline in 10 years)	Data summarised for first 8 years of the fishery, so early trends unclear, but decline rapid in the 2nd half of the fishery and has persisted to present.
China	1960-	No quantitative data.	(No quantitative	(No quantitative data,

Geographical area and description of records.	Time scale	Average catches or sightings per year	Overall (decline) or increase in catches	Average (decline) or increase per decade
	1990	Reported to be common in the 1960s, occasionally caught in the 1970s, and rare in 1980s and 1990s.	data, but decline to very low levels reported.)	but significant decline indicated in the 1960s and 1970s.)
Isle of Man sightings	1985-1998	Table 1 presents steady decrease in sightings/effort.	(Average sightings declined by ~90%)	(Average sightings declined by ~90%)

Targeted NE Atlantic basking shark landings (no. of sharks caught), 1946-1996.

Year	Achill Island	Other Irish catches	Scotland	Norway[2]	Norway 5-yr mean	Total	Total 5-yr mean
1946	0		66	426		492	
1947	6		245	250		501	
1948	80		222	964	837	1,266	1,254
1949	450		35	782	913	1,267	1,673
1950	905		77	1,764	942	2,746	2,026
1951	1,630		147	806	868	2,583	2,128
1952	1,808		68	392	848	2,268	2,243
1953	1,068		110	596	554	1,774	2,094
1954	1,162		0	682	498	1,844	1,879
1955	1,708			294	472	2,002	1,570
1956	977			528	377	1,505	1,340
1957	468			258	747	726	1,533
1958	500			122	1,541	622	2,030
1959	280			2,532	1,844	2,812	2,189
1960	219			4,266	2,046	4,485	2,320
1961	258			2,042	2,463	2,300	2,653
1962	116			1,266	2,384	1,382	2,526
1963	75			2,210	1,792	2,285	1,899
1964	39			2,138	1,748	2,177	1,813
1965	47			1,304	2,331	1,351	2,380
1966	46			1,822	2,521	1,868	2,570
1967	41			4,180	2,719	4,221	2,784
1968	75			3,160	3,213	3,235	3,277
1969	113			3,130	3,190	3,243	3,250
1970	42			3,774	2,642	3,816	2,706
1971	29			1,708	2,453	1,737	2,519
1972	62			1,438	2,256	1,500	2,337
1973	85	0		2,214	2,236	2,299	2,385
1974	33	150		2,148	2,194	2,331	2,338
1975	38	350		3,670	2,224	4,058	2,355
1976	0	?		1,502	2,095	1,502	2,209
1977				1,586	2,119	1,586	2,197
1978				1,570	1,706	1,570	1,706
1979				2,268	1,561	2,268	1,561
1980				1,606	1,430	1,606	1,430
1981			0	776	1,268	776	1,292
1982			1	930	992	931	1,035

[2] Numbers of sharks caught by Norway are calculated from data of landings in metric tonnes and assuming a mean weight of 5t per shark. This calculation may under-estimate numbers of sharks taken by up to 30%.

Year	Achill Island	Other Irish catches	Scotland	Norway[2]	Norway 5-yr mean	Total	Total 5-yr mean
1983			122	758	797	880	848
1984			92	888	740	980	799
1985			40	631	624	671	683
1986			38	493	518	531	556
1987			1	352	392	353	411
1988			15	228	343	243	355
1989			3	256	310	259	314
1990			2	387	386	389	392
1991			1	325	456	326	459
1992			9	732	476	741	480
1993			0	582	403	582	407
1994			9	353	354	362	358
1995			0	22	231	22	232
1996				83		83	
1997				114		114	

Norwegian basking shark landings[3], recorded by ICES Fishing Area from 1973.

	Area I	Area IIa	Area IVa	Area Vb(1)	Area VIa	Area VIIb-c	
	Barents Sea	N. Norway	S.Norway /Shetland	Faeroes	W.Scotland	W. Ireland	Total
1973	20	1,850	150			160	2,180
1974		1,598		200		350	2,148
1975		2,776	444		450		3,670
1976	14	1,488					1,502
1977	5	1,581					1,586
1978		1,443		6		120	1,570
1979	1	2,206				60	2,268
1980		1,570		36			1,606
1981		764		12			776
1982		849				80	930
1983		416	316			26	758
1984	1	375	530				906
1985	1	630					631
1986		493					493
1987		70					70
1988		3	43				46
1989			256				256
1990		71	315				387
1991		103	222				325
1992		221	511				732
1993		492	90				582
1994		301	51				353
1995		21	1				22
1996		83					83
1997							
1998							

Source: reports of the ICES Study Group on Elasmobranch Fishes.

[3] Numbers are derived by converting published landings (tonnes) to number of 5t fish. This may result in an under-estimate of the numbers of sharks taken by up to 30%.

Detailed review of additional fisheries for basking shark.

Scotland

Fairfax (1998) summarises the limited information available on the earlier 18th and 19th century fisheries in Scotland. These appear, like the Irish fishery, to have ceased by the mid 1830s, with large numbers of sharks not being reported again until the 1930s. Fairfax (1998) and Kunzlik (1984) present data on landings from the 20th century Scottish basking shark fisheries, which concentrated on the Firth of Clyde and West coast (see Annex I). Several such fisheries started up in the 1940s, some targeted full time at the basking shark during the summer season, while others were more opportunistic. Regardless, all appear to have ceased after only a few years of good catches (Figure 3, Annex 3 & 4a). It is unclear whether this fishery was short-lived because of stock depletion (by the Scottish fishermen themselves, or Norwegian shark catchers operating close to the west coast of Scotland), or because of falling oil prices in the 1950s.

Oil prices rose again in the mid 1970s, Norwegian catchers took several hundred sharks in 1975, some Clyde basking shark by-catch was processed in the late 1970s, and a small target harpoon fishery started again in the Clyde in 1982. Initial yields from this fishery were good, but these were extremely short-lived and the fishery ceased at the end of 1994 after several poor years of catches (Fairfax 1998, Annex 4a).

Canadian Pacific

Basking sharks are common in the traditional knowledge of the Hesquiat and Ahousat people along the central west coast of Vancouver Island. In the 1940s, salmon fishermen complained about the problems with these fish being caught in their nets in Barkley Sound, Vancouver Island. The Department of Fisheries and Oceans therefore ran a shark eradication programme in the 1950s. A large blade was placed on the bow of Fisheries vessels and the sharks were rammed and killed. Information on the numbers of fish killed in this manner varies. Newspaper articles report a maximum of 31 being killed in one day and 50 in the first month of operation in 1956, and a total of 59 sharks killed in 1955 and 51-56 in 1956. Clemens and Wilby (1961) state that 'several hundred' were killed in Barkley Sound up to 1959. Presumably the programme ceased when numbers had been depleted to the extent where basking sharks were no longer posing a significant problem to the salmon fishermen. Darling and Keogh (1994) state 'Basking sharks are rarely sighted in Barkley Sound today, suggesting that the majority of the population in that area were killed.' It seems that a single vessel managed to deplete significantly the Barkley Sound stock of basking sharks over a period of just a few years. This occurred between 35 and 40 years ago, but the population has not recovered (Annex 3).

California, USA

Basking sharks were only taken occasionally during the winter in Californian waters before a directed fishery commenced. Harpooning was initially only for sport, with carcasses incidentally being processed for oil and fish meal. However, the value of these products increased until the fishery became profitable and was operated from two centres: Monterey Bay and the San Luis Obispo Bay to Morro Bay area, 100 miles to the south. These two small areas are the two most important locations for winter concentrations of basking sharks along the central and northwestern southern Californian coast (Squire 1990). An average of 25 sharks *per annum* was landed during each season (September to May) from 1924 and 1938, with a maximum of about 100 in a single year. The fishery was inactive for several years then was revived in autumn 1946 to develop new uses for the valuable liver oil. It was also intended to process the carcasses for their very thick leather and for animal feed meal, and dry the fins for export to China. Three hundred basking sharks were taken in the first season, with 12 vessels operating in Monterey Bay and about six in the San Luis Obispo Bay area. Some vessels were directed to basking sharks on or near the surface by a spotter plane (Phillips 1947). This fishery continued until the early 1950s with about 200 sharks taken annually (Roedel and Ripley 1950, Annex 3). Squire (1967) reports that the fishery was suspended in California in 1950, because of the low prices paid for the oil and the low availability of basking sharks. Lea (pers. comm.) reports that basking shark sightings off central California over the past 20 years are not as numerous in the past. It has been suggested that the early 1940s and 1950s fisheries reduced the populations substantially, and that the species has never fully recovered.

Japan

The main targeted Japanese basking shark fishery used to take place off Nakiri, on the Shima Peninsula, Mie Prefecture. Basking shark hunting is recorded as a traditional activity here since the Edo era (1772). However, basking sharks were also taken as by-catch in the 1960s in set nets in the Nakiri area and elsewhere (including Onahama on the Pacific coast of Middle Japan, and near Tokyo). The fishing season was during the main basking shark migration through the area from March to May. Sharks were most abundant in March.

The basking shark fishery became more intensive in 1967 when oil prices rose, and Nakiri fishermen began harpooning larger numbers of sharks. The fishery used vessels of under 3 tons with a crew of two (one harpooner and one skipper). The fishing boats usually worked in pairs, one acting as the catcher and the other towing the sharks. The main use for the sharks during this period was the valuable squalene-rich liver oils. Shark fin was also important and was considered a middle ranked shark fin in Taiwan. Shark meat was sold for human consumption, or processed into fishmeal for animal feed.

During the 12-year period from 1967 to 1978, more than 1,200 individual basking sharks were harpooned (an average of about 100 per year). During the last few years of the fishery, from 1975 to 1978, catches gradually decreased, from about 150 sharks in 1975, to about 20 in 1976, nine in 1977, and six in 1978. The fishery ceased completely in the early 1980s as a result of falling oil prices and the declining numbers of sharks sighted (Annex 3). In the 1990s, only 0-2 basking sharks have been sighted each year off Nakiri during the migration season. This compares with a peak year in 1972, when more than 60 basking sharks were processed for sale in Nakiri market. (This information was compiled from Yano 1976 and 1979, and Uchida 1995.)

China

Parry-Jones (1996a in Phipps 1996) reports that basking sharks used to be landed by a harpoon fishery in Fujian Province and Guangxi Zhuang Autonomous Region up to the 1970s. The species was commonly caught in the 1960s, but is seldom landed now. The report concludes that catches and landings of this species had decreased over the last 40 years, and recommended prohibition of catches of this species (and whale sharks *Rhincodon typus*) in near-shore waters as a precautionary measure until their status is ascertained.

Incidental fisheries

There are reports of finned basking sharks being washed up dead in areas where no directed fisheries are known to exist (e.g. Monterey Bay, van Sommeran pers. comm.). Berrow (1994) extrapolated from very limited observer data to suggest that 77-120 sharks may be taken annually in the bottom set gill net fishery in the Celtic Sea (south of Ireland), though the reliability of this estimate has been questioned (P. Kunzlik in litt.). Berrow and Heardman (1994) received 28 records from fishermen of sharks entangled in fishing gear (mostly surface gill-nets) around the Irish coast during 1993, representing nearly 20% of all records of the species that year. At least 22% of basking shark by-catch in fishing nets died. By-catch in Isle of Man herring fishery has amounted to 10-15 sharks annually, and a further by-catch source here is entanglement in pot fishermens' ropes, amounting to some 4-5 fish annually (Watterson in litt.). Lien and Fawcett (1986) record that at least 410 basking sharks were caught between 1980 and 1983 in salmon gill nets and cod-traps in the coastal waters of Newfoundland. Some basking sharks were also taken in deepwater trawls nearby during the winter months. Fairfax (1998) also reports that basking sharks are sometimes brought up from deep water trawls near the Scottish coast during winter. In contrast to these relatively large coastal by-catches, extrapolation of observer data from oceanic gill net fleets suggests that only about 50 basking sharks were among the several million sharks taken annually offshore in the Pacific Ocean (Bonfil 1994).

DRAFT CITES Identification Manual for the Basking Shark *Cetorhinus maximus*

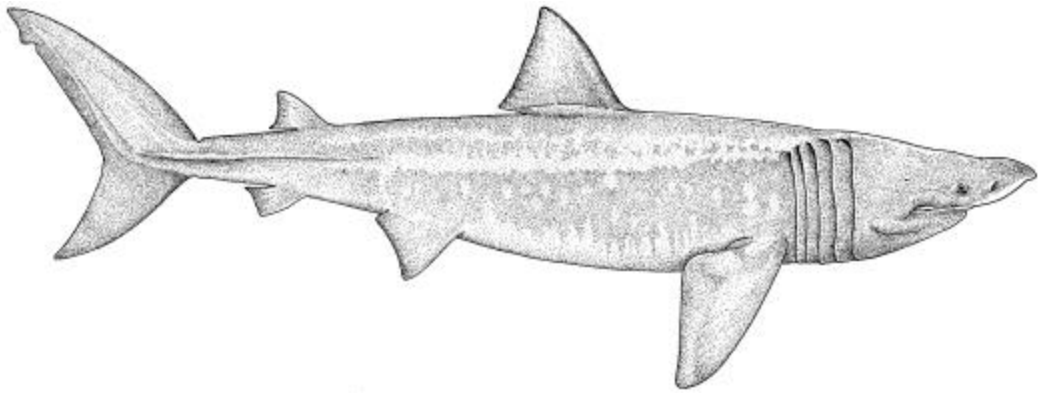
These sheets constitute Annex 6 of proposal 11.49, namely to include basking shark *Cetorhinus maximus* on Appendix II of CITES, submitted by the United Kingdom.

Class Chondrichthyes (subclass Elasmobranchii) / Family Cetorhinidae **Appendix II (proposed)**

Cetorhinus maximus **(Gunnerus, 1765)**

Common names:
Engl.: Basking Shark
Fr.: Requin-Pélerin
Esp.: Tiburón Peregrino
De.: Riesenhai
Ital.: Squalo elefante

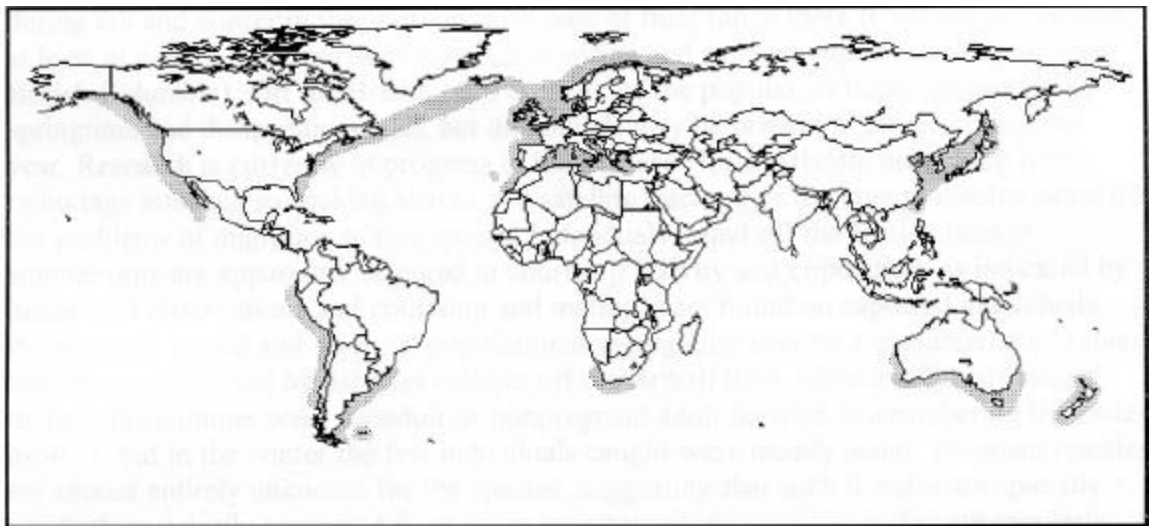
Scientific synonyms: *Halsydrus pontoppidani*, *Tetroras angiova*, *Squalus gunnerianus*, *Squalus homianus*, *Squalus pelegrinus*, *Squalus peregrinus*, *Squalus (Cetorhinus) gunneri*, *Squalus (Cetorhinus) shavianus*, *Scoliophis atlanticus*, *Squalus isodus*, *Squalus rostratus*, *Squalus elephas*, *Squalus rashleighanus*, *Squalus rhinoceros*, *Squalus cetaceus*, *Polyprosopus macer*, *Cetorhinus blainvillei*, *Selachus pennantii*, *Cetorhinus maccoyi*, *Cetorhinus maximus forma infanuncula*, *Cetorhinus maximus normani*.



Characteristics:

Whole specimens: *Cetorhinus maximus* is the second largest shark in the world. Specimens landed from international waters would be 'introduced from the sea', but most *C. maximus* are captured in inshore territorial waters. Whole specimens may be identified by their great size (up to 10m length and 5-7t weight), enormous gill slits that almost encircle the head, gillrakers, pointed snout, minute teeth with a single hooked cusp in a huge mouth, pronounced lateral keels on the caudal peduncle and the lunate tail fin. Juveniles have a particularly long, hooked snout (they are born at a total length of 1.6 to 2 m, and reach maturity at 4-5 m for males and perhaps 8 m in females).

Distribution: Temperate and (in summer) boreal waters of continental and insular shelves, usually close to the coast. Not recorded from the tropics. Records from warmer areas are often of dead, stranded or moribund specimens.



(Taken from Compagno 1984).

Population:

Wild Population: Although widely distributed, Basking Sharks are generally infrequently recorded except in a few apparently favoured coastal areas, where they are usually seen in relatively large numbers for only part of the year. Fished populations have shown to yield rapidly declining landings and the species is now rare in former centres of abundance. Listed as Vulnerable on the IUCN *Red List of Threatened Species*.

Captive population: None known.

Trade: Typically traded as fins, oil or meat. Entire animals only likely to be introduced from the sea or territorial waters and not otherwise traded.

Intra-specific variation: Minor morphological differences have been observed in specimens described from different regions, but these are insignificant compared with the major differences between *C. maximus* and other species.

Similar species: The basking shark is the only species of the family Cetorhinidae. It has a very distinctive appearance, and is unlikely to be confused with any other species (except possibly for large specimens of the great white shark (*Carcharodon carcharias*- see proposal 11.48 – for which an identification sheet is in preparation) if it is not clearly seen in areas where their range overlaps - e.g. in southern Australia). The fins of the adults are extremely large and, for this reason alone, are very unlikely to be confused with those of any other species when detached from the body. The whale shark also has very large fins, but the skin of the whale shark (*Rhincodon typus*) is spotted and the fins are rounded at the tips, while the basking shark has pointed fin tips.

DRAFT CITES Identification Manual page for the Basking Shark

These sheets constitute Annex 6 of proposal 11.49, namely to include basking shark *Cetorhinus maximus* on Appendix II of CITES, submitted by the United Kingdom.

Shark fins / Family Cetorhinidae **Appendix II (proposed)**

Cetorhinus maximus **(Gunnerus, 1765)**

Common names:
Engl.: Basking Shark
Fr.: Requin-Pélerin
Esp.: Tiburón Peregrino
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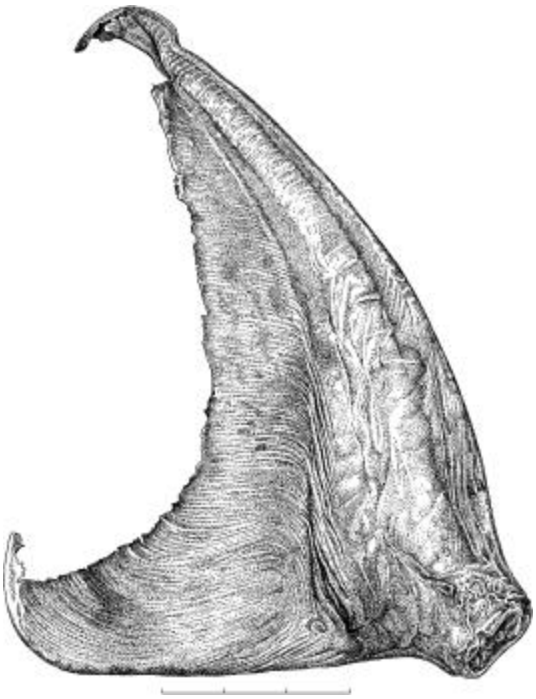
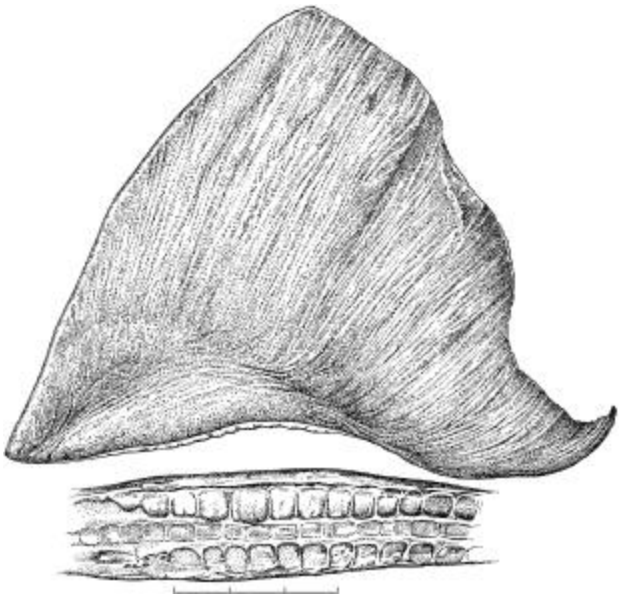
Scientific synonyms: *Halsydrus pontoppidani, Tetroras angiova, Squalus gunnerianus, Squalus homianus, Squalus pelegrinus, Squalus peregrinus, Squalus (Cetorhinus) gunneri, Squalus (Cetorhinus) shavianus, Scoliophis atlanticus, Squalus isodus, Squalus rostratus, Squalus elephas, Squalus rashleighanus, Squalus rhinoceros, Squalus cetaceus, Polyprosopus macer, Cetorhinus blainvillei, Selachus pennantii, Cetorhinus maccoyi, Cetorhinus maximus forma infanuncula, Cetorhinus maximus normani.*



Caudal fin
(scale: 1 division = 10cm)



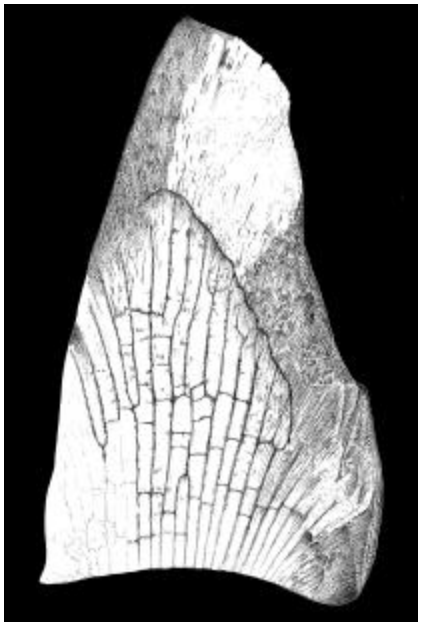
Dorsal fin (with detail of root)

Traded products: Traded products derived from basking sharks include meat (fresh, frozen or salted for human consumption, or rendered into fishmeal), fins, liver oil (this has a high squalene content and has been valuable for industrial use), cartilage (used as a health food), and possibly hide (for leather products). While processed meat, oil and cartilage are more difficult to identify without undertaking DNA testing in the laboratory, individual fins and fin sets can be identified more easily if traded intact or only partly processed.

Fins: The fins of *C. maximus* are very large, with first dorsal and tail fins reaching up to 2 m in height in mature adults. They are generally pale grey with no distinctive pigmentation patterns, have pointed tips and their trailing edges may be slightly frayed. The tail fin is almost crescent-shaped, with a deep notch near the top of the

upper trailing edge. The skeletal structure of the pectoral fins is also characteristic, although radiography is required to examine the fin cartilage in intact fins.

Pectoral fin



Radiograph of pectoral fin

Because large fins are more valuable when sold in fin sets, often for display and final preparation in restaurants, the fins taken from *C. maximus* are usually traded in a set of four: the tail fin, pair of large pectoral fins, and the first dorsal fin. The smaller second dorsal fin, pelvic (or ventral) fins and anal fin are of lower commercial value and may be sold as secondary or miscellaneous fins. Because their value partly depends on being sold as recognisable fins, *C. maximus* fins are most likely to enter trade intact (dried or frozen) or semi-prepared. In the latter case the skin, cartilaginous base plate and any remaining meat will be removed and the fin dried, but the fibres will be intact and the fin shape unaltered. The hard cartilage of the dorsal fins and the cartilaginous platelets between the two layers of fin needles may, very occasionally, also be removed.

Distribution: Temperate and (in summer) boreal waters of continental and insular shelves, usually close to the coast. Not recorded from the tropics.

Wild Population: Although widely distributed, *C. maximus* are generally infrequently recorded except in a few apparently favoured coastal areas, where they are usually seen in relatively large numbers for only part of the year.

Trade: Most of the world trade in shark fins involves imports, exports and re-exports between China, Hong Kong and Singapore. Hong Kong Customs data record shark fin imports from 125 countries and re-exports to 75 countries during the period 1980-1995 (Rose 1996). Many of the fins entering Hong Kong are processed in China before being re-exported in processed form via Hong Kong. There is known to be some international trade from Norway to Singapore and Japan, and exports of sharks taken in by-catch in New Zealand and Europe also enter international trade.

Intra-specific variation: Minor morphological differences have been observed in specimens described from different regions, but these are insignificant compared with the major differences between *C. maximus* and other species.

Similar species: Fin sets or individual fins from other large elasmobranchs (whale sharks *Rhincodon typus*, large lamnid sharks, and very large specimens of guitarfish and sawfish) may potentially be confused with *C. maximus* fins. They may usually be differentiated by fin shape (particularly when a whole fin set is being traded), colour and skin pattern.

In some cases, the skeletal structure of the pectoral fin (obtained through radiography) may have to be examined.

Whale sharks also have very large fins, but these can be distinguished by their clearly rounded tips and, if the skin has not been removed, the spotted pigmentation.

Other large lamnid sharks (e.g. great white shark, porbeagle, salmon shark, and Mako sharks) have similar crescent-shaped tail fins, but these will only rarely overlap in size with *C. maximus* fins.

The upper lobes of the tail fins of large Carcharhinid and hammerhead sharks are characteristically much longer than the lower lobes, while *C. maximus* and lamnid shark fins are almost crescent-shaped.

Guitarfish and sawfish are bottom dwelling batoid fishes (more closely related to the rays than sharks). Although some have very large, valuable 'white' dorsal fins, their pectoral fins are joined to their heads and their tail fins are not clearly crescent-shaped.